MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (TERM ID 2220)

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

5 JULY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **3 printed pages** (including the cover page) with **4 questions only**.

2. Each question is worth **25 marks. Attempt ALL questions.**

3. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

(a) Solve the following equations and inequalities:

(i) $\frac{x}{x+1}=\frac{3}{x^2+x}+\frac{2}{x+1}$. [5 marks]

(ii) $\sqrt{x-2}=1-\sqrt{x-1}$. [4 marks]

(iii) $3x^2-5x-1\le 4x^2+7x+19$. [6 marks]

(iv) $\frac{2x+7}{x-4}>3$. [6 marks]

(b) Simplify $\frac{(2xyz^2)^4(x^{-2}y^3)^2}{4x^2(y^2z^{-3})^4}$ so that all exponents are positive. [4 marks]

Question 2 (25 marks)

(a) Given $f(x)=(x+1)^3(x-1)^2(x-2)$,

(i) determine the end behaviours of the graph of $f(x)$. [1 mark]

(ii) find the x- and y- intercept(s), if any. [3 marks]

(iii) find the multiplicity for each zero, then state whether the graph touches or crosses the x-axis at each x-intercept. [3 marks]

(iv) determine the maximum number of turning points. [1 mark]

(v) sketch the graph of $f(x)$. [4 marks]

(b) Given $f(x)=5-2x$ and $g(x)=\frac{x+1}{x+3}$. Find:

(i) $(f\circ g)(2)$ [3 marks]

(ii) $g^{-1}(x)$ [3 marks]

(c) Solve the following equations:

(i) $e^{5-x}+4=20$ [3 marks]

(ii) $\log_3(x+3)-\log_3(x-7)=2$ [4 marks]

Continued....

Question 3 (25 marks)

(a) Given a function of $f(x) = x^3 + 2x^2 - 5x - 6$. Use polynomial division to find the quotient and the remainder when the $f(x)$ is divided by:

(i) Use polynomial division to find the quotient and the remainder when $f(x)$ is divided by $x + 1$. Then, determine whether $x + 1$ a factor of $f(x)$. [5 marks]

(ii) Test the discriminant of the quadratic part if it can be further factored into two liner factors. Hence, find the remaining factors of $f(x)$. [3 marks]

(b) Given $f(x) = 3x^4 - 11x^3 + 10x - 4$.

(i) Use the Rational Root Theorem to list the potential rational roots of $f(x)$. [5 marks]

(ii) Based on your answer in part (b)(i), apply the Factor Theorem to identify one factor of $f(x)$. [2 marks]

(c) Write the partial fraction decomposition of $f(x) = \dfrac{x}{x^2 - 5x + 6}$. [10 marks]

Question 4 (25 marks)

(a) (i) Find the 14^{th} term of the arithmetic sequence 4,7,10,13,.... [3 marks]

(ii) In the sequence of Part (a)(i), find n if $a_n = 271$. [2 marks]

(iii) Find the sum of the following arithmetic series, $\sum_{k=1}^{120} 4k + 10$ [4 marks]

(b) Initially, a pendulum swings through an arc of 2 feet. On each successive swing, the length of the arc is 0.9 of the previous lenth.

(i) Find the length of the arc of the 10^{th} swing. [3 marks]

(ii) After 15 swings, what total length will the pendulum have swung? [2 marks]

(c) (i) Perform the Binomial Expansion using Pascal's Triangle for $(2t + \frac{3}{t})^4$.

[8 marks]

(ii) Find the 5^{th} term in the Binomial expansion of $(y + 3)^8$. [3 marks]

End of Paper